

Questions on Verbal Behavior and its Application to Individuals with Autism: An Interview with the Experts

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A note about the interviews from the editors:

The use of Skinner's Verbal Behavior (VB) classification system has been increasingly applied to learners with autism. We asked several of the best known behavior analysts to answer some key questions regarding this practice, the state of research regarding the advantages of this approach, and the confusion that exists regarding the application of VB to this population of learners.

We structured the responses to follow each question separately, indicating the responder in each case. At the end of the interviews, you will find relevant references from each responder.

We are very grateful to Dr. Mark Sundberg, Dr. Barbara Esch, Dr. John Esch, and Dr. Andrew Bondy for their thoughtful and wise replies.

1. Can you briefly explain the relevance of Skinner's analysis of verbal behavior to intervention for children with autism?

Bondy

Skinner's analysis provides a guide for teachers and professionals, as well as parents, to determine factors that relate to the control of language. When we teach any skill, I must know the controlling conditions currently in place- where we are now- and the controlling conditions I aim for by the end of the lesson- where we are going. Skinner reminds us to always consider the ABCs of behavior and not to become 'blinded' by the behavior in isolation.

Esch and Esch

First, it's important to recognize that the advantages of Skinner's analysis of verbal behavior (1957) aren't limited to just those individuals with a diagnosis of autism. The analysis is widely applicable to any language behavior, whether typical or atypical, developmentally appropriate or developmentally delayed, regardless of age, diagnosis, or etiology of condition.

Skinner's analysis made it clear that language responses occur, not in isolation, but within a context of ongoing environmental events (i.e., antecedents and consequences). Responses that occur within particular contexts are said to have different *functions*. As Iwata and colleagues (1982/1994; also see Hanley, Iwata, & McCord, 2003; Lerman et al., 2005) and many other researchers (see Sautter & LeBlanc for a review, 2006) have shown, a functional analysis of behavior is critical to informing intervention. If responses are weak, wrong, or otherwise somehow deficient, an analysis of the contexts in which they occur can help us determine what to do. That is, we can identify the stimuli that currently evoke and maintain behavior (or those that currently *fail* to do so) and we can compare this information to the stimuli that *should* control these, or other, responses that we want to develop. Then we can use

behavioral procedures (e.g., prompting, fading, differential reinforcement) to eliminate errors by establishing desired language skills (or other skills) under appropriate stimulus control. Without this analysis, we run the risk of recommending interventions that may be ineffective at best, or detrimental at worst.

For children with a diagnosis of autism, Skinner's analysis also provides a wealth of "why to's." Many skills that are absent or difficult to acquire for individuals with autism (e.g., echoic, self-echoic, self-editing, problem solving, autoclitics) are discussed in *Verbal Behavior*, yet these topics remain severely under-investigated by researchers. It would be very helpful to have more research in these areas so that clinical interventions could be developed to address these important skills.

Sundberg

The most important component of an intervention program for a child with autism involves the development of language and social skills (e.g., Lovaas, 1977). In the early years of autism treatment (i.e., Bijou, Baer, Wolf, Risley, Hart, Sloane, Birnbrauer, and Lovaas, at the University of Washington in the 1960s) immediate and significant gains in language and social skills were made from the systematic use of basic behavioral procedures (e.g., reinforcement, extinction, prompting, fading, shaping, task analysis). Little was available on the applications of Skinner's (1957) analysis of verbal behavior at the time. These researchers simply used the established expressive-receptive cognitive framework of language as the basis of their curriculum. This practice continued unabated until research on verbal behavior began to emerge in the 1970s and 1980s. The data began to provide an empirical foundation for Skinner's argument that language is learned behavior controlled by environmental contingencies, and that "expressive language" is actually comprised of different types of operant behavior. Specifically, the mand, tact, and intraverbal relations that are traditionally subsumed under the single category of expressive language, are functionally related to *different* environmental antecedent variables. The mand is controlled by motivating operations (Michael, 1988, 2007), the tact is controlled by nonverbal discriminative stimuli, and the intraverbal is controlled by verbal discriminative stimuli.

The importance of this conceptual distinction was observed in clinical applications where the data demonstrated for example, a word acquired as a tact may not occur as a mand (Hall & Sundberg, 1987; Lamarre & Holland, 1985), or as an intraverbal (Braam & Poling, 1982; Luciano, 1986). The implications for children with autism or other types of developmental disabilities were that a language intervention program must be careful to ensure that all three types of expressive language are specifically developed, rather than relying on cognitive processors to mediate the responses. The growing body of empirical research supporting Skinner's conceptual analysis of language provides further evidence for moving beyond the traditional expressive-receptive framework and cognitive theories of language as the basis for autism language intervention programs and curricula (for literature reviews see Oah & Dickinson, 1989; Sautter & LeBlanc, 2006).

There are many applications of Skinner's analysis of verbal behavior for improving the language skills of children and adults with language delays. In Sundberg and Michael (2001) we suggested that greater gains could be made with language delayed populations by incorporating Skinner's behavioral analysis of language into existing behavioral programs. The following suggestions were made: (1) incorporate mand training into the daily intervention programs; (2) incorporate intraverbal training into the daily intervention programs when appropriate; (3) make use of the motivating operation (MO) as an independent variable in language training; (4) use Skinner's analysis of the verbal operants as a framework for language assessment rather than the expressive-receptive formulation; (5) use Skinner's analysis of the verbal operants as a framework for a language intervention curriculum rather than the expressive-receptive formulation; (6) use a functional analysis of verbal behavior to analyze errors and

verbal deficits much in the same way that descriptive and functional analyses are used to analyze behavior problems; and (7) make use of Skinner's analysis of automatic reinforcement.

2. Describe any common misinterpretations of VB as it is applied to individuals with autism. How would you rectify or address them?

Bondy

I see a major problem in how the phrase 'verbal behavior' is used. Skinner used it to both define a type of operant behavior and as the title of a book. Nowhere in the book is there a 'how to' section- a place that describes how to design and implement effective lessons. Just as with our Pyramid Approach to Education, PECS is a part of a part of that broad system, so too is the issue of verbal operants just a small part of the entire package that people now refer to as Applied Verbal Behavior. I would like to see the phrase 'verbal behavior' to remain as Skinner intended- either it refers to a class of operants or to a particular book.

Esch and Esch

See question 3

Sundberg

There are many. I will address a few of the major ones below.

(1) The misconception that verbal behavior is somehow separate from applied behavior analysis.

Language *is* behavior and the same behavioral principles and procedures that are common to nonverbal behavior are applicable to verbal behaviors (Skinner, 1957). As stated above, early behavioral autism treatment made use of behavior modification procedures and methods and made significant gains, but the language programs (the foundation of the curriculum) were based on cognitive theories of language. These early approaches were identified as "discrete trial training" (DTT) and "applied behavior analysis" (ABA). Both of these titles are misleading in that a discrete trial is simply a three-term contingency, and the field of Applied Behavior Analysis is far broader than just autism treatment procedures. However, these descriptors remain today as the primary identifiers of a behavioral approach to autism treatment, and they typically refer to these early packaged behavioral models. The terms, "ABA/VB" or "verbal behavior approach" have been used to identify behavioral methodologies that make use of Skinner's analysis of verbal behavior along with basic behavioral teaching methodology. The use of Skinner's analysis of verbal behavior as the foundation for the language program, rather than cognitive theories of language, is closer to what Skinner described in *Science and Human Behavior* (1953) as the applied science based on the principles of behavior.

(2) The "verbal behavior approach" is new

I hear this a lot; "VB is new." Actually, it pre-dates Lovaas and DTT. Joe Spradlin from the University of Kansas published the Parsons Language Sample in 1963. This was a language assessment program for developmentally disabled individuals based on Skinner's (1957) verbal operants. I used it as a subject measure in my doctoral dissertation (Sundberg, 1980). And with Spradlin's permission, I modified this tool and it served as the starting point for the BLAF and the ABLLS (Sundberg, 1983) and later the VB-MAPP (Sundberg, 2008). Spradlin was doing mand, tact, and intraverbal training in the 60s and 70s, as was Louise Kent (Kent, 1974) and other behavior analysts (e.g., Joe Paer, Howard Sloane). In the mid-to-late 1970s over 50 VB research projects were conducted at the Kalamazoo Valley Multiply

Handicapped Center (now called Croyden Avenue School). Most of these studies were theses and dissertations supervised by Jack Michael, and were presented at the MABA/ABA conventions during that time period. A listing of many of these studies can be found in the journal *The Analysis of Verbal Behavior* (Sundberg & Partington, 1982, 1983). The “Lovaas method” was clearly more popular than VB, but VB has existed all along. Verbal behavior applications were less popular because they were more complicated and required more extensive academic training, and few behavioral programs offered courses in Skinner’s verbal behavior. Now people have “discovered” things like mand training and transfer between the verbal operants and are calling them new and *untested*.

(3) The misconception that just doing, for example mand and intraverbal training, or using an assessment tool associated with VB (e.g., the BLAF, ABLLS, VB-MAPP) one is now “doing verbal behavior.”

On a number of occasions I’ve encountered situations where the word “requesting” is replaced with the word “manding” in the training material and on the data sheets and the program is then presented as a “verbal behavior program.” While this is a step in the right direction, the use of Skinner’s analysis of verbal behavior as a foundation for an assessment and intervention program is far more complex than just doing requesting or mand training. For example, with manding there must be a solid understanding, analysis, and application of the concept of motivating operations (MOs) and its functional distinction from stimulus control (S^D s). Monitoring and careful analyses are required to determine if “acquired” mands are indeed under the control of MOs, and if the mands have generalized, become spontaneous, are functional in the natural environment, and are appropriately incorporated and emitted along with the other verbal operants in daily verbal discourse. It is also important to ensure that the mand repertoire is progressing along the lines of typical language development, occurs under autoclitic contingencies, and has not become defective in any way. There are other examples of the surface application of verbal behavior that are problematic to the evolution of behavioral treatment for individuals with autism, some of which will be described in later sections.

(4) The misconception that Skinner’s analysis of verbal behavior is inadequate for the analysis of complex behavior such as emerging relations, equivalence, novelty, relational frames, or generative grammar.

The primary focus of Skinner’s (1957) analysis of verbal behavior is on the analysis of complex human behavior. However, the analysis of these complexities in the book can be missed with the typical applied focus on just establishing the basic elementary verbal operants (i.e., mands, tacts, intraverbals). Following Skinner’s introduction of the elementary verbal operants in Chapters 3-8 of *Verbal Behavior* (1957), he presents an analysis of multiple control, autoclitics, self-editing, logical and scientific verbal behavior, and thinking. It is not uncommon to see published overviews of Skinner’s book that do not go beyond the elementary verbal operants, leaving readers and those designing intervention programs with the misconception that the analysis only covers beginning verbal behavior. The advanced concepts in the second half of the book, along with Skinner’s analysis of private events, automatic contingencies, and extensions of verbal behavior are essential analytical tools for interpreting virtually all complex behavior (Catania, 1998; Donahoe & Palmer, 2004; Moore, 2008). In a recent paper (Michael, Palmer, & Sundberg, in press) we described how Skinner’s analysis of multiple control provides the behavioral foundation and explanatory principles for the concepts of naming, multiple exemplar training, equivalence, and relational frames, as well as a variety of other complex behaviors.

3. People identify VB as an instructional strategy, or present it as associated with specific approaches that are not related to the analytic tool per se. (e.g., VB is naturalistic, VB is fast paced, VB is a further evolution of DTI, VB uses interspersal, VB uses sign). Please comment on this, and provide suggestions for clarification in the field.

Bondy

The elements of the AVB package involve many strategies, such as traditional DTI, Pivotal Response Training, the Pyramid Approach, or the CABAS model contain many strategies addressing a wide array of skills. Only some of the targets that a student requires involve communication, though, of course I believe that they are the most important. But in the long run, people need a broad array of functional skills to make it in our society and the book *Verbal Behavior* does not offer a clear guide to the selection or teaching of those skills. Furthermore, packages need to be assessed for the long term outcomes- and if successful, then may need a component analysis as well. It will be very important to demonstrate that a group of young children with autism who were provided quality services guides by the AVB package results in important changes in communication as well as functioning within school, home and the community. We cannot reason that the research of Lovaas and colleagues supports applied behavior analysis in general and that the AVB package improves upon that research- we have no empirical evidence of that as yet.

Some seem view to AVB as aligned with sign language. However, protocols such as PECS are fully dependent upon Skinner's analysis. Skinner's analysis supports the understanding of an operant class of behaviors- verbal behaviors- wherein different members may vary in form while being 'the same' operant because of the similar functional control. Theoretically, support of any member of an operant class provides support for all members- that is, improved use of verbal behavior via pictures or signs or devices should have an equivalent effect on supporting the modality of speech. Empirically, there is no evidence that one particular alternative/augmentative system has a greater impact upon the acquisition or expansion of speech and that is consistent with Skinner's analysis. Biases are revealed when some people talk about incomplete comparisons as when someone compares a sign approach with PECS but stops after discrimination training rather than completing the protocol. When the protocol is taken past Phase IV (as in the elegant work of Ruth Anne Rehfeldt)- when a delayed prompt strategy is introduced to support vocal production- it becomes clear that there is no advantage of one modality over others in the support of speech. In the long run, a debate about form or modality- sign, pictures, devices, speech- detracts from the focus on a functional analysis that is the heart of Skinner's work.

Esch and Esch

Skinner's analysis of language behavior is not an instructional strategy or a teaching approach – it's an analysis. It analyzes the environmental contexts in which particular verbal responses occur.

This is a great advantage for teachers and clinicians. Why? Because an analysis that can pinpoint antecedent and consequent events surrounding language responses can help us select treatments that might be more effective and reject treatments that are not informed by the analysis. But regardless of which treatments we choose, they should not be confused with the analysis itself. In his book *Verbal Behavior* (1957), Skinner didn't talk about, specify, or prescribe procedures to develop particular verbal operant functions.

The strategies and assumptions you mention (e.g., interspersals, fast-paced, naturalistic) are simply different presentation approaches, and they should be distinguished from the analysis that Skinner gave us to identify the contextual function of language responses. Teaching strategies, such as those you mentioned in your question, are arbitrary, and should be chosen depending on the learner and his or her particular needs at any given point in the treatment program. For example, during mand training (or any other operant training), fast paced instruction may be indicated at one point in the instruction, yet it may be *contraindicated* at other times. Similarly, some children learning the mand function usually benefit from instruction in a variety of settings, some of which may, or may not, be "naturalistic." In the same

way, it would be inappropriate to advise that all children should acquire mands via one communication mode (e.g., sign) versus another (e.g., picture selection). Such decisions are highly idiosyncratic to the learner's needs, but regardless, they have nothing to do with the functional analysis of the language responses themselves.

Sundberg

It is important to distinguish between behavioral procedures and the behavioral principles that all procedures are based upon. In the 1960s behavior modification became popular in education, but quickly fell out of favor when various behavior modification procedures did not work. For example, token economies (based on the principles of conditioned and intermittent reinforcement) and time out (based on the principle of punishment) were common procedures used in classrooms, but quite often were incorrectly administered (e.g., Kuypers, Becker, & O'Leary, 1968). It was not uncommon to place the failure on shortcomings of behaviorism rather than incorrect or inappropriate implementation of a specific behavioral procedure. I worry that the same effect is occurring with the implementation of verbal behavior where the focus is on the procedures rather than on the analysis and underlying behavioral principles.

The instructional strategies listed above, as well as several others often cited (e.g., mixed verbal behavior format, first trial data, errorless teaching procedures) are not the defining features of the verbal behavior approach, nor are they specific only to verbal behavior methodology. For example, natural environment training is not unique to VB it began with Hart and Risley's (1975) work on incidental teaching, sign language is certainly not unique to VB, nor are interspersal or behavioral momentum techniques. These all are just procedures which may or may not be effective with any individual child or skill. The defining elements of a VB approach involve the use of the behavioral principles and Skinner's conceptual analysis of language to analyze all aspects of the language assessment and intervention program, including defective language skills.

4. Do you think that there are implications for the delivery of speech services to individuals with autism, based on the use of the VB classification system?***Bondy***

While working within a statewide public school system for students with autism, we taught all teachers and SLPs about Skinner's verbal operants. We clarified the analysis by having people become more skillful at identifying what Skinner referred to as 'impure' verbal operants. That is, by noting each possible antecedent and consequence factors one may be able to distinguish between a pure mand- asking for a cookie (in this case by speech) upon entering a room- versus an intraverbal/echoic/mand/tact- saying 'cookie' after someone says, "What do you want? Say, 'cookie'" while holding up a cookie. If an SLP (or teacher) cannot analyze the difference then ensuing lessons are likely to be ineffective. The analytic tool offered by Skinner is equally effective with speech, sign, PECS or speech-generating-devices. Skinner is clear that a functional analysis is at the heart of his perspective.

I give lots of credit to Lori Frost- a certified speech/language pathologist- for recognizing many years ago that she did not need to wait for children to acquire speech in order to begin working on verbal behavior via PECS. She saw that it was possible to work on verbal behavior in one modality while simultaneously working on vocal production and vocal use issues- and this view was supported by her understanding of Skinner's analysis.

Esch and Esch

If you start thinking about language as behavioral responses that can be affected by environmental stimuli, then you don't have to wait until a child is "developmentally ready" to begin speech-language training. That is, if you have a clear understanding of stimulus control and of behavioral principles and procedures to effectively strengthen, weaken, or transfer this control, then you can arrange learning environments to generate mand, tact, echoic, and other verbal operant responses.

Where to start? Skinner's (1957) analysis of the mand, and Michael's (1988, 1993) explication of motivating operations support the notion that mand training is probably the "best first step" for beginning speech-language training for children with a diagnosis of autism. After all, this skill (requesting) predominates in a typical child's early language responding. Furthermore, mand acquisition provides a powerful communication tool with inherent social reinforcers (i.e., mands have to be mediated by another person) that can support further language learning.

It should be noted, though, that transfer from one verbal function to another (e.g., mand to tact) isn't automatic. That is, just because a child learns to ask for *doggy* when he wants his favorite stuffed animal doesn't mean that he will say *doggy* when he sees one running in the park. In fact, a growing body of evidence (e.g., Goldsmith, LeBlanc, & Sautter, 2007; Shafer, 1994; Sundberg, San Juan, Dawdy, & Argüelles, 1990) supports this assumption, making clear that the various verbal functions identified by Skinner (e.g., mand, tact, intraverbal, echoic) are independent of one another. That is, acquisition of one operant function does not automatically result in acquisition of another; thus, each function may have to be specifically taught.

This is why a thorough working knowledge of behavior analysis is so important for anyone teaching speech-language. The research based on this science allows us to view speech-language as a function of the antecedent/consequent environment in which it occurs, in contrast to a traditional view of speech-language, which tends to focus on response topography without analyzing the functional control for a particular response form (for a discussion of this issue, see Esch, LaLonde, & Esch, 2010).

A behavioral analysis focuses our clinical attention not on an isolated response form (e.g., *doggy*), but instead on the response function (the conditions under which the child says *doggy*). These conditions are the antecedent and consequent events to which the clinician has access and which the clinician can alter, precisely because of this access, to bring about behavior change, which is, after all, the treatment goal.

Sundberg

Absolutely! As stated above the primary component of an intervention program for a child with autism involves language and social behavior. Intervention programs need speech pathologists who understand language acquisition and can teach classroom and program personnel and family members how to do language intervention. There is a growing movement within the field of speech-language pathology to adopt Skinner's analysis of verbal behavior as the foundation for language assessment and intervention (see www.behavioralspeech.com, and www.baojournal.com/SLP-ABA%20WEBSITE/index.html). The highly regarded author of many speech-language pathology textbooks M. H. Hegde (2010) points out, "While speech-language pathologists (SLPs) accept the behavioral methods of treatment in their professional work, they tend to entertain an inadequate or dismissive view of the behavioral analysis of language and grammar (p. 90). Hegde goes on to describe

the basic elements of Skinner's analysis of language and its many advantages for the practice of speech-language pathology. He encourages SLPs to use the verbal operants as the framework of language and concludes, "If the SLPs also adapt a functional (cause-effect) analysis of VBs, they would then be internally more consistent with their concepts and treatment methods." (p. 110)

The historical role of the speech-language pathologist has been to conduct individualized "pull-out" sessions, often with a focus on articulation and language intervention based on the receptive-expressive framework. I think this has begun to change and we're seeing more SLPs in classrooms working collaboratively with teachers, BCBAs, and instructional aides. However, it still is not uncommon for a program to relegate a child's primary language IEP goals to a speech-language pathologist's individual session. By adapting a behavioral orientation to language and the verbal operant framework, it becomes clearer to the speech-language pathologist that much of language occurs under functionally separate antecedent conditions and needs to be developed outside of a 1:1 structured teaching session and in the natural context of on-going events. Manding, as one example, is highly dependent on the strength of active motivators that occur throughout a child's day. Many of these motivators are not present during structured teaching sessions. An effective program should involve teaching all those involved with the child, including the family members, how to capture or create motivators in all environments in order to establish and expand the mand repertoire. An overall role for the SLP then should be to engineer the child's environment for the facilitation of verbal interactions of all types.

5. What are the most important research questions in using VB with children with autism?

Bondy

As noted, one area is the demonstration that a package described as AVB results in a host of positive, functionally relevant outcomes in a specific period of time. I think Mark Sundberg's recent work on the intraverbal is very interesting and may result in excellent progress for our students in this crucial social skill. I also think that issues related to what I call 'the language of emotions' should lead to better development and implementation of lessons of this nature. Finally, I think that the autoclitic operant is basically ignored in terms of our understanding and teaching. For example, I'm waiting for the little study showing the effective and functional acquisition of the word 'really'- as in, "I really want a glass of water." Now that would really be exciting!

I also would like to see more research on how to best transition between any two modalities where the emphasis is on the functions of the modalities under study, rather than an attempt to answer a poorly thought out question such as "Which is the best alternative modality?"

Esch and Esch

There are several promising areas for future verbal behavior research, and much of it would be applicable to children with a diagnosis of autism. We mention two that we think are most critical, and offer a list of others that we hope will spark further research.

1: What are the most effective and efficient procedures to increase vocalizations in low-vocal, pre-speech, or non-echoic children?

It's relatively easy to teach speech to children who can echo a vocal model, or who emit a wide variety of speech sounds, because there's a lot of "raw material" to shape. But for children who don't vocalize very much, or who are not readily echoic, it can be very difficult to establish effective

contingencies of reinforcement that will support speech development. There is some evidence (e.g., Esch, Carr, & Grow, 2009; Miguel, Carr, & Michael, 2002; Petursdottir, Carp, Matthies, & Esch, in press) that a stimulus-stimulus pairing procedure (SSP) can be effective to condition human voice as a reinforcer for vocal responding, but the evidence isn't robust nor is it clear which children are most likely to respond to this procedure. Another procedure recently reported (Esch, Esch, & Love, 2009) is the use of a lag schedule to differentially reinforce vocal variability, again to increase the number of available sounds that can be shaped into speech. Although a Lag 1 was effective in this experiment to increase vocal variability in 3 participants, this was the first study to apply a lag schedule to increase vocal behavior in this population of young, pre-verbal children with autism. So, much more research is needed in this area.

2: Why and how should we conduct functional assessments of verbal behavior, and how might this better inform our treatments?

Although Skinner's analysis of verbal behavior has been extensively applied to *teaching* language to children with autism, only a few (e.g., Baker, LeBlanc, & Raetz, 2008, Esch et al., 2010; Lerman et al., 2005; Sundberg, 2008; Sundberg & Partington, 1998) have discussed the importance of developing *assessments* of verbal behavior function for this or other populations. If the goal of assessment is to inform treatment, then function-based language targets (i.e., mand, tact, and so forth) must be supported by function-based assessments. These assessments should direct, for example, the content, curricular sequence, required stimulus control support (e.g., prompts, transfer procedure), relation to listener skill development, and other critical decisions, in order to design appropriate interventions. There is a great need for these analyses, made more urgent by two factors: (a) for children with a diagnosis of autism, there has been an explosion of intervention programs throughout the world in which language training, but not necessarily assessment, focuses on Skinner's verbal operants and (b) many of the speech-language assessments that are conducted for children with autism are linguistic-based standardized tests for which no corresponding linguistic-based treatments exist (see Esch et al., 2010).

3: Other important research questions:

What maintains vocal stereotypy? Can it be reduced by procedures similar to those used for visual stereotypy (e.g., blocking)?

How is the self-echoic acquired and what is its role in more complex language behavior (e.g., remembering, problem-solving)?

What is a child doing when he is "listening?" When does "listener behavior" become "speaker behavior?"

Sundberg

Twenty years ago I suggested 301 potential research topics from Skinner's book *Verbal Behavior* (Sundberg, 1991). Many of these topics have been addressed, and several thematic lines of conceptual and empirical research have been established (Sautter & LeBlanc, 2006). A significant amount of progress has been achieved, but we have only scratched the surface in realizing the potential of Skinner's analysis of verbal behavior. Language permeates virtually every aspect of human behavior and when it fails to develop, additional problems are highly likely (e.g., behavior problems, social deficits, academic delays). It is incomplete to study any of these problems without considering their connection to verbal behavior. A primary focus of the early lines of research has been on demonstrating the functional independence of the verbal operants and establishing procedures for teaching each of the verbal operants to individuals with language delays. Given this solid body of research, the foundation is set for more advanced and detailed lines of research. I will suggest six potential topics below.

1) *Verbal conditional discriminations.* The primary antecedent variables for most intraverbal behavior involve verbal conditional discriminations (VC^Ds), which are a type of multiple control (Skinner, 1957, Chapters 9-11). A VC^D can be defined as two or more components of a verbal antecedent stimulus where one verbal stimulus alters the evocative effect of the second verbal stimulus (or vice versa). For example, the question, “Can you name a fruit that is green?” contains multiple verbal stimuli where the word “fruit” affects the word “green.” If the question is changed to, “Can you name a vegetable that is green?” the word “vegetable” affects the word “green” in a different manner, and a different response would be considered correct. Children with autism characteristically have a difficult time acquiring a functional intraverbal repertoire and this is largely due to the complexity of verbal stimulus control. However, very little research has been conducted on VC^Ds (Axe, 2008; Sundberg & Sundberg, in press). Direction for future research in this area can come from not only *Verbal Behavior*, but from the extensive body of work on conditional discriminations involving mainly nonverbal behavior. For example, the study by Saunders and Spradlin (1989) suggests teaching the individual components of a conditional discrimination independently, and then systematically bringing them together can facilitate acquisition.

2) *Multiple control and the emergence of novel and generative verbal behavior.* Skinner’s (1957) chapters on multiple control along with his chapters on autoclitic behavior (Chapters 12-14) provide an extensive analysis of how behaviors emerge without being directly taught (see also Alessi, 1987). Convergent and divergent multiple control (Michael, Palmer, & Sundberg, in press) are at the heart of his analysis, and Skinner devotes all of Chapter 11 to analyzing how novel behaviors emerge through fragmentary recombinations of previously reinforced responses. Specifically, convergent control by multiple variables determines responding to novel configurations of stimuli and motivational variables when they share some, but not all of the features of an original source of control (i.e., fragmentary recombination). For example, if a child is learning about personal safety and an adult says *Show me what you do when a stranger asks you to get in his car*, it is important that the target responses also be evoked by novel antecedent configurations of stimuli that might share fragments of the original antecedent conditions. The verbal stimulus *What if a stranger offers you money for a video game?* should evoke similar verbal and nonverbal responses as the original verbal stimulus, as should several other novel configurations involving different motivators (e.g., candy, finding a lost dog, removing an aversive like rain), different nonverbal stimuli (e.g., settings, people), different verbal carrier phrases, and so on. This is especially important in training since there is a high probability that the actual antecedent configuration that a child might encounter may contain any combination of novel variables along with the primary source of control (i.e., a threat to personal safety).

Divergent multiple control is also an important element for establishing generative safety repertoires since it will be important that a single stimulus configuration evoke a number of different safety responses (e.g., saying “no,” screaming, running away, finding and telling an adult). However, as previously mentioned, should an actual threat to a child’s safety occur, there will certainly be additional sources of control present. For example, it is highly likely that a threatening situation elicits respondent behaviors, establishes new reflexive MOs, and evokes a multitude of additional private events such as covert verbal behavior that will enter into the antecedent configuration (e.g., self-mands to stay calm, tacts of the situation, intraverbals regarding options, autoclitic mands and tacts, self-echoics). The teaching procedures based on multiple control identified as “multiple exemplar training” (e.g., Greer & Ross, 2008) and “general case” (Becker, 1987) are often effective in establishing these target generative repertoires.

Multiple control is pervasive in social behavior, perception, creativity, problem solving, memory, literature, thinking, the emergence of novel behavior, generative language, and so on. But multiple control is more than an interpretive tool, it is an element of almost all verbal behavior in natural environments and therefore must be accommodated by our therapeutic interventions and other applications. An analysis

of the role of multiple control will inevitably sharpen and improve such applications, but research in these areas is just beginning.

3) *The distinction between MOs and stimulus control.* The field of behavior analysis has a long-standing, but confusing and conflicting treatment of motivation as a source of behavioral control. In many behavioral textbooks motivation is not considered as an independent variable, or given the focus that the other behavioral principles and major concepts such as reinforcement, extinction, stimulus control, and generalization receive (see Michael, 2007 as an exception). However, in all of Skinner's early books (1938, 1953, 1957), and in the first generation of textbooks on behavior analysis (Holland & Skinner, 1961; Keller & Schoenfeld, 1950; Millenson, 1967) motivation was presented as a basic principle of behavior with multiple chapters in each book dedicated to its treatment. In many of the later textbooks motivation was either dropped as a topic or incorrectly moved to the consequence side of the three-term-contingency (for a historical analysis of motivation in behavior analysis see Sundberg, 2004).

The distinction between motivating operations (MOs) and stimulus control (S^D) has many conceptual and applied implications and benefits. The line of research on the differences between the mand and the tact primarily involves the distinction between MOs and S^D s. There are many potential lines of research that could be of significant benefit to children with autism such as the role of motivation as an additional independent variable for establishing new verbal behavior. People, especially children, like to talk about topics that are motivating to them. Such motivation plays an important role in acquiring new intraverbal behavior, such as that obtained from reading books, blogs, or tweets, as well as searching for content from the internet. It certainly seems possible that individuals with autism could acquire more complex forms of intraverbal behavior if the MO variable is capitalized upon. Given the ubiquitous nature of MOs in human behavior it is surprising that there is not more basic and applied research in the behavioral literature on this topic.

4) *Automatic contingencies.* Skinner (1957) suggested that a significant amount of verbal (and nonverbal) behavior is acquired and maintained, or weakened, without the direct manipulation of contingencies by others. Vaughan and Michael (1982) suggested that automatic contingencies play an important role in behavior analysis, but have been neglected as a conceptual tool and research topic. However, there are many aspects of a person's verbal and nonverbal repertoires that occur without the deliberate manipulation of contingencies, and research on these effects are very important to providing a more complete behavioral analysis. For example, a speaker acquires a specific accent without any contrived reinforcement by his verbal community. Mannerisms of respected or idolized individuals are acquired through similar effects. Freud termed this process as "identification." Palmer (1996) suggested that a child's acquisition of many aspects of syntax and grammar occurs through automatic contingencies. And a few studies have now demonstrated how children with autism can acquire new forms of verbal behavior through a stimulus-stimulus pairing procedure leading to automatically reinforced responding (for a review of the existing literature see Stock, Schulze, & Mirenda, 2008).

One of the major goals in all types of instruction for children with autism is that new behaviors are eventually acquired and maintained without deliberate or contrived teaching arrangements. However, early learning for many children may require careful teaching to establish the basics of a skill, with the goal of natural or automatic contingencies eventually taking over. One important effect of automatic contingencies is that they can shape behavior in an extremely efficient manner, often much better than contrived reinforcers (Palmer, 1996; Skinner, 1957). For example, learning to blow bubbles on a soapy wand may initially require imitative prompts and differential reinforcement. But blowing too hard makes the bubbles quickly pop, and not blowing hard enough will not produce any bubbles at all. The perfect amount of breath to blow bubbles is eventually shaped by the naturally occurring (automatic) consequences of the bubbles produced, more so than by praise from an adult.

There are many skills that a typically developing child acquires through the process of automatic contingencies. Most children can learn new skills just by observing others performing that skill (termed “observational learning”). One child may pour sand over a spinning wheel and gain enjoyment watching the wheel spin. Another child then imitates the behavior with his sand and wheel and he too gains enjoyment. This new behavior occurs without adult intervention consisting of prompts and reinforcement, but rather through observing the peer, with the reinforcement automatically provided by the spinning wheel. Once skills such as imitation are established (as in structured teaching) they are refined and maintained by the functional use of the skill and their natural consequences. The process of automatic contingencies can not only provide conceptual guidance for skill development, but many intervention strategies as well.

5) *Social behavior.* Social behavior is a component of almost all human interactions and takes many forms. It can be observed in play activities, competition, shared experiences, entertainment, friendship, romance, empathy, sports, the arts, literature, academic and intellectual behaviors, and so on. The breadth of this particular area of human behavior is enormous, which is why assessment and intervention is so complicated. Most children with the diagnosis of autism experience some degree of social impairment; it's a major part of the diagnostic criteria. While a substantial body of behavioral research now exists and “Although major progress has been made in the past decade, much work remains to be done” (Weiss & Harris, 2001, p. 785). It is often quite difficult to identify the specific social deficits affecting a child with special needs. Many typically developing children experience social problems as well. The problems range from extreme shyness to dominance and social aggression. Part of the difficulty of working in this area is that there are many complicated behavioral repertoires that fall under the rubric of “social behavior.”

There are three general behavioral repertoires that comprise social behavior and each repertoire has many components. These repertoires can be identified as (1) nonverbal social behaviors, (2) verbal social behaviors, and (3) listener social behaviors. The nonverbal elements of social interaction involve behavior such as making eye contact, proximity to others, body posture and positioning, dress and hygiene, facial expressions, and movement. The verbal elements are extensive and are the primary source for the content of social interactions. Any given social interaction involving verbal behavior is dependent on many aspects of a child's existing verbal repertoires and interests, such as his ability to mand for information, emit intraverbal responses, and appropriately edit his responses. The listener repertoires involve appropriate attending to a speaker, reinforcing speaker behavior (eye contact, head nods, empathy, appropriate affect), responding to the mands of a speaker (mediating reinforcement), functioning as an S^D (audience) for verbal behavior, and appropriate turn taking in the speaker-listener dyad. Any given act of social behavior can and usually does involve a combination of these different behaviors. Consequently, the ability to initiate, maintain, and appropriately terminate social interactions is complex. As pointed out by Weiss and Harris (2001) research is just beginning in these areas, yet given its importance to the assessment and treatment of autism it seems it has received relatively little behavioral attention. It is quite possible that Skinner's analysis of verbal behavior as a conceptual framework of social interaction can provide new directions for assessment and intervention programs.

6) *Defective or impaired verbal operants.* There are many ways that a developing verbal repertoire can become rote or impaired. In the VB-MAPP Barriers Assessment I present 24 common barriers experienced by individuals with autism or other types of developmental disabilities. Most of these are related to language in one way or another. Many of the barriers have a long history of behavioral research (e.g., echolalia, prompt dependency, hyperactivity) while others have a very limited research basis. Perhaps most striking is the absence of a line of research on impaired mands, tacts, and intraverbals. Each of these verbal operants is susceptible to becoming impaired for any number of different reasons. For example, the mand may not be controlled by MOs, but by unwanted or unsuspected forms of stimulus control (thus functionally not a mand). Tacts beyond those involving nouns (i.e., verbs, prepositions,

adjectives) may be emitted in what appears to be topographically correct form (e.g., tacting “red ball”), but may be functionally incorrect (revealed when one asks, “What shape is this?” and the child responds “Red ball”). Intraverbal repertoires are probably the most susceptible to becoming rote because of the role of verbal conditional discriminations described above. Research in these areas could be very beneficial to developing language intervention programs for children with language delays and might prevent the establishment of rote responding and prompt dependency. More specific suggestions can be found in the language barriers chapter in Sundberg (2008).

6. How would you evaluate the quality of evidence that exists for VB as it applies to individuals with autism?

Bondy

I’m not sure that this question has a direct answer- that is, an answer that pertains only to autism. I think that if Skinner’s analysis of verbal operants is helpful in terms of the design and implementation of functional communication and language lessons, then it will be helpful for everyone. There is no autism technology. Skinner’s analysis is helpful because it draws our attention to the controlling variable with regard to verbal operants. For example, Skinner wrote “...the contingencies which generate a response to one’s own verbal responses are *unlikely* in the absence of *social reinforcement* (p. 314).” Remind you of anyone you work with? Are they having trouble acquiring autoclitics (i.e., responses to one’s own verbal responses)? So, the analysis may help us understand a source of a problem but that in and of itself does not suggest one and only one solution. I look forward to the expansion of everyone’s use of the analysis of verbal behavior to improve all the language-related lessons for all students.

Esch and Esch

If you’re talking about the behavioral *procedures* used to instruct the acquisition of verbal skills, there is extensive empirical support in the behavioral literature, both basic and applied, that these procedures are effective across species, disability areas, diagnoses, and so forth.

On the other hand, if you’re referring to outcomes studies (implementation of specific program procedures in which language targets are selected according to Skinner’s verbal operants), it’s more difficult to evaluate. That is, it’s difficult to obtain treatment integrity of a “VB approach” because there’s no clear agreement about what constitutes this approach. For example, it’s possible that each child might essentially have a different curriculum, with lopsided attention to some, versus other, operants at any given time. Similarly, different learners may require different communication modes (e.g., sign vs. speech vs. picture selection) either throughout, or at different points in, their programming. We think it’s imperative that distinctions be drawn among (a) the implementation of behavior-based, empirically supported teaching procedures (e.g., differential reinforcement, fading, shaping), (b) selection of language targets based on Skinner’s analysis of verbal behavior (i.e., function), and (c) the individual learning needs of particular learners (e.g., behavior plans, communication modes, curricular content, inclusion settings).

Regarding treatment integrity of non-programmatic (i.e., single subject) empirical research, in recent years there has been an increase in reporting measures of treatment integrity (i.e., what the experimenter did). This is critically important to increase our confidence in research outcomes. In addition, we’re now beginning to see inter-observer agreement (IOA) reported for treatment integrity in these single subject reports. This means that people are beginning to recognize the importance of measuring and reporting not only experimenter behavior, but also whether there was agreement about it. IOA has long been reported for the dependent variable (i.e., what the participant did), so it’s good to see a trend toward measuring integrity of independent variable application as well.

Sundberg

First, it is important to recognize that “the verbal behavior approach” makes use of the same basic procedures derived from applied behavior analysis as the other forms of behavioral interventions (e.g., Lovaas, 1977, 2003). Thus, the evidence regarding, for example, the role of reinforcement in establishing new behaviors applies to the verbal behavior methodology. The difference, as identified previously, is primarily in the use of the verbal operants as the foundation of the language assessment and intervention program, rather than the cognitively based expressive-receptive distinction. The evidence for the value of the distinction between the mand, tact, and intraverbal is quite strong (e.g., Sautter & LeBlanc, 2006) and is growing at a much more rapid pace than in previous decades. In addition, it is important to note that there is no opposing body of evidence that suggests that the mand, tact, and intraverbal are the same types of language.

This question however, is usually about the absence of large group outcome research specifically for the “verbal behavior approach” (e.g., Carr & Firth, 2005, Green, 2005). While this type of research is the “gold standard” in many academic circles, it is not in behavior analysis. Skinner pointed out, little can be learned about behavior from group research designs and “instead of studying a thousand rats for one hour each, or a hundred rats for ten hours each...study one rat for a thousand hours” (1966, p. 21). While an outcome study may show that an intervention package that contains dozens of different independent variables is better than a control group that does not contain those same independent variables, the results will not tell us how a child learns, or how to teach specific skills (e.g., develop a fluent intraverbal repertoire). The results from group outcome studies are important, but are more for convincing the general public than for advancing the scientist’s understanding of the subject matter.

The specific problem with group outcome studies is that the actual independent variables responsible for learning are impossible to identify or replicate. For example, one outcome study (Howard, Sparkman, Cohen, Green & Stanislaw, 2005), while clearly a behaviorally solid and well-designed intervention program, lists the following (at least 35) independent variables administered over a two-year period:

“Children in the IBT group received ... 50–100 learning opportunities per hour presented via discrete trial, incidental teaching, and other behavior analytic procedures. Instruction occurred during formal, structured sessions as well as less structured situations, such as supervised play dates with typically developing peers....Programs...were delivered using a combination of behavior analytic techniques, including general case programming to maximize skill generalization and most-to-least prompt and prompt-fading procedures to minimize errors during skill acquisition. Children were taught to select their own reinforcers, record their own performances, and sequence their learning activities as appropriate for each child. Direct observational data on each child’s progress were reviewed by program supervisors several times each week, and intervention procedures (e.g., reinforcers, instructions, prompts, pacing of learning opportunities, etc.) were modified as needed. Each child’s programming was delivered by a team of 4–5 instructional assistants, each of whom worked 6–9 h per week with the child. Instructional assistants were employed part-time while they attended college. They were trained and supervised by staff with master’s degrees in psychology or special education and coursework as well as supervised practical experience in applied behavior analysis with children with autism. Some supervisors were assisted by staff with bachelor’s degrees and (typically) graduate coursework in behavior analysis. Each supervisor was responsible for programming for 5–9 children and worked under the direction of a Board Certified Behavior Analyst who was also a licensed psychologist (the first author) and a licensed speech and language pathologist (the second author). Parents received training in basic behavior analytic strategies, assisted in the collection of maintenance and generalization data, implemented programs with their children outside of regularly scheduled intervention hours, and met with agency staff one

to two times a month....efforts were made to ensure treatment integrity (e.g., through frequent direct observation and videotaping of staff implementing procedures with children, and frequent feedback from supervisors). (p. 366)

Which of these variables might be the most responsible for learning? If funding is short, what can be cut? If I were to speculate as to what the five most important independent variables were I'd guess (1) using the basket of basic behavioral procedures (no fewer than 15 independent variables here), (2) using college students enrolled in a behavioral psychology or special education program as instructional assistants (3) frequent monitoring and feedback by upper level staff, (4) videotaping sessions, and (5) parent training. However, the data gathered will not provide any information as to which of the variables produced the learning, thus replication or any specific information on an individual child is impossible. The study of the individual independent variables will tell us more about language acquisition than can be obtained from a group design using multiple independent variables, implemented in a variety of ways, on a variety of different schedules, by a variety of people, across long time spans.

These same 35 independent variables could be generally found in a verbal behavior program to varying degrees, along with the use of the mand, tact, and intraverbal distinctions, and other suggestions made by Sundberg and Michael (2001). The additive nature of verbal behavior can now be seen in many existing "ABA" programs, such as the Lovaas Institute where the description of the model on their website now includes the bullet point "Requesting is developed as early as possible" (www.lovaas.com/approach-detailed.php), an element specifically attributed to the "verbal behavior approach" by Gina Green in 2005. Dr. Philip Hineline (2010) recently presented a symposium at ABAI attempting to compare the "Lovass model" with the "verbal behavior model" and concluded they were becoming increasingly similar. The main issue again is that the distinction between the verbal operants, rather than the "expressive" only category, can reveal procedural differences that can enhance the effectiveness of EIBI.

However, it is acknowledged that some form of outcome data can be valuable to the advancement and acceptance of programs based on verbal behavior. Carr & Firth (2005) recommended repeated individual case studies using Skinner's analysis of verbal behavior along with behavioral teaching methodology as one type of valuable outcome data. At a recent ABAI convention Miklos, Dipuglia, & Galbraith (2010) presented outcome case studies for 122 children from 20 different public schools in Pennsylvania. The data showed that all children made significant linguistic and social gains over a school year. The average skill acquisition for the 122 children was 14.66 milestones as measured by the VB-MAPP (Sundberg, 2008). The Pennsylvania Technical and Training Assistance Network (PaTTAN) and its dedicated team from its Verbal Behavior Project now supports over 130 classrooms across the state of Pennsylvania that follow the verbal behavior model using the VB-MAPP as an assessment program and curriculum guide.

In conclusion, Skinner's analysis of verbal behavior provides a behavioral formulation of language that is consistent with established principles of behavior and supporting empirical research. When this conceptual analysis is added to the basic behavioral procedures common to applied behavior analysis, greater clinical gains for children with autism and other developmental disabilities are possible. I appreciate this opportunity to provide this interview and hope that behavior analysts as well as other professionals will view the development of behavioral interventions for individuals with language delays as the cumulative work of an entire professional field that has evolved over at least a 50-year period. Behavior analysis has much more to offer children with autism and other types of developmental disabilities, and I feel we have only begun to realize the potential of our science.

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